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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s):	AVNI, Dov et al.	Examiner:	BRUTUS, Joel F.
Serial No.:	10/551,053	Group Art Unit:	3777
Filed:	May 16, 2007	Confirmation No.:	4577
Title:	APPARATUS AND METHOD FOR LIGHT CONTROL IN AN IN-VIVO IMAGING DEVICE		

APPEAL BRIEF

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This Appeal Brief is being filed following the January 28, 2011 Notice of Appeal and the March 29, 2011 Notice of Panel Decision from Pre-Appeal Brief Review (the "March 29, 2011 Notice"), which set the due date for filing the Appeal Brief as April 29, 2011. Thus this paper is being timely filed.

REAL PARTIES IN INTEREST

The real parties in interest in this Appeal are Given Imaging, Ltd., ("Given") an Israeli corporation, the assignee of U.S. Patent Application No. 10/551,053, and its U.S. subsidiary, Given Imaging Inc., of Norcross, Georgia.

RELATED LITIGATIONS, APPEALS AND INTERFERENCES

There are no prior or pending litigations, appeals or interferences known to Applicants that may be related to, may directly affect, or may be directly affected by or have a bearing on the Board's decision in this Appeal.

STATUS OF CLAIMS

Claims 81, 85, 90, 91 and 97-102 are currently pending in the Application and have been rejected. Claims 1-80, 82-84, 95 and 96 have been cancelled. Claims 86-89 and 92-94 have been withdrawn from consideration.

STATUS OF AMENDMENTS

Applicants' response filed November 29, 2010 has not been entered and the amendments provided in that paper are not being discussed herein.

SUMMARY OF CLAIMED SUBJECT MATTER

Independent claim 81 is directed to an in vivo imaging device including a light source, an imager including a plurality of pixels, and a controller. (See, e.g., Figs. 2-4, page 7 line 11 to page 8 line 17 of the specification as filed). The controller is configured to, within each of a number of imaging periods, operate the light source to emit white light, record, via one or more control pixels (where the control pixels are a subset of the plurality of pixels) the amount of the white light that is reflected to the imaging device, control the image gain level of the imager based on the amount of the white light that is reflected to the control pixels (e.g., page 52, line 14 to page 53, line 10, Fig. 16A), and capture and transmit an image frame. (e.g., page 8, line 20, page 13, line 30 to page 14, line 15). This cycle occurs across a number of imaging periods. (See, e.g., page 53, lines 7-9).

Independent claim 90 is directed to a method for operating an in vivo imaging device. The imaging device includes a light source and an imager including pixels. (e.g., Figs. 2-4, page 7 line 11 to page 8 line 17). The method includes, within each of a number of imaging periods, operating a light source to emit white light, at a sampling instance, recording the amount of the white light that is reflected to one or more control pixels (where the control pixels are a subset of the pixels) (e.g., page 52, line 14 to page 53, line 10, Fig. 16A), and

comparing an amount of the white light recorded at a sampling instance (e.g., page 42, lines 1-14) in the imaging period to a determined light saturation threshold (e.g., page 42, line 13). The device's gain factor is controlled in relation to the difference between the amount of the white light and the saturation threshold. (e.g., page 52, lines 21 to 30). An image frame is captured and transmitted. (e.g., page 8, line 20, page 13, line 30 to page 14, line 15). This cycle occurs across a number of imaging periods. (See, e.g., page 53, lines 7-9).

Independent claim 97 is directed to a method for changing the operation mode of an in vivo device. (e.g., page 50, lines 10-27). The device includes an imager including pixels and a light source. (e.g., Figs. 2-4, page 7 line 11 to page 8 line 17). The method includes in each of a number of imaging periods, operating the light source to emit white light, recording the amount of the white light reflected to control pixels (the control pixels being a subset of the pixels), and in response to the recorded amount, adjusting an image gain level of the imager. (e.g., page 52, line 14 to page 53, line 10, Fig. 16A). An image frame is captured and transmitted. (e.g., page 8, line 20, page 13, line 30 to page 14, line 15). An environment parameter in an environment surrounding the device is measured. (e.g., page 50 line 27 to page 51, line 9). This occurs across a plurality of imaging periods. (See, e.g., page 53, lines 7-9). When an environmental change is determined the operating mode of the device is changed. (See, e.g., page 50 line 27 to page 51, line 9; page 53, line 26 to page 54, line 16).

Independent claim 100 is directed to a method for changing the operation mode of an in vivo device. (e.g., page 50, lines 10-27). The device includes an imager including pixels. (e.g., Figs. 2-4, page 7 line 11 to page 8 line 17). The method includes, within each imaging period, operating a light source to emit white light, and recording the amount of white light that is reflected to control pixels (the control pixels being a subset of the pixels), and in response to the recorded amount, adjusting a gain level of an imager within the device. (e.g., page 52, line 14 to page 53, line 10, Fig. 16A). An image frame is captured and transmitted. (e.g., page 8, line 20, page 13, line 30 to page 14, line 15). An environment parameter in an environment surrounding the device is measured using an environment measuring tool. (e.g., page 50 line 27 to page 51, line 9). This occurs across a plurality of imaging periods. (See, e.g., page 53, lines 7-9). When an environmental change is determined, the operating mode of the device is changed. (e.g., page 50 line 27 to page 51, line 9; page 53, line 26 to page 54, line 16).

GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

In the September 28, 2010 Final Office Action, the Examiner rejected claims 81, 85, 90-91, and 97-102 under 35 U.S.C. § 103 as being unpatentable over Tanaka et al. (US Patent No. 6,667,765, "Tanaka") in view of Yamanaka et al. (US Patent No. 6,219,091, "Yamanaka") and further in view of Higuchi et al. (US Patent No. 6,254,531, "Higuchi") and further in view of Fulghum (US Patent No. 6,364,829, "Fulghum").

The grounds of rejection to be reviewed on appeal are that claims 81, 85, 90-91, and 97-102 are allowable and not obvious over any combination of Tanaka, Yamanaka, Higuchi and Fulghum.

ARGUMENTS

Summary

Applicants' claim 81 recites, inter alia:

> a controller, wherein the controller is configured to, across a plurality of imaging periods, within each imaging period, operate the light source to emit white light, record, via one or more control pixels, *the control pixels being a subset of the plurality of pixels*, the amount of the white light that is reflected to the imaging device, control the image gain level of the imager based on the amount of the white light that is reflected to the imaging device, and capture and transmit an image frame. (emphasis added)

Claims 90, 97 and 100 each include different limitations from claim 81, but the arguments below apply to those claims as well.

In the Final Office Action, the Examiner rejected claims 81, 85, 90-91, and 97-102 under 35 U.S.C. § 103 as being unpatentable based on a combination of Tanaka, Yamanaka, Higuchi Fulghum.

This rejection does not rise to the level of a *prima face* rejection, and the combination in the rejection does not make obvious Applicants' claims.

Nowhere in the Final Office Action does the Examiner explain where Applicants' claim limitation of "the control pixels being a *subset* of the plurality of pixels" (emphasis added) exists. The Examiner's statements regarding this limitation made in the December 9, 2010 Advisory Action ("Advisory Action") and the March 29, 2011 Notice are incorrect and inconsistent with each other.

The Examiner does not provide a *prima face* rejection, as the combination of references listed by the Examiner includes references which are not tied by the Examiner to specific Applicant claim limitations, and which seem duplicative to each other regarding which of Applicants' claim limitations to which they *might* apply. In addition, certain limitations, e.g. "the control pixels being a subset of the plurality of pixels," are clearly not taught or suggested by the prior art cited by the Examiner.

Fulghum

The Examiner finds "subset" (the control pixels being a subset of the plurality of pixels) in Fulghum at times by referring to a level of a pixel, and at times by referring to a number of output pixels in an image (which are selected because of their level). Neither of these definitions or uses of subset is relevant to or can be used with "record[ing], via one or more control pixels, the control pixels being a subset of the plurality of pixels, the amount of the white light that is reflected to the imaging device". Neither of these definitions can help to make obvious Applicants' invention, and these Examiner definitions are inconsistent with each other.

On page 3 of the Final Office Action the Examiner stated that Fulghum teaches a pixellated CMOS device, but the Examiner did not in the Final Office Action assert that Fulghum teaches control pixels.[1]

On the Continuation Sheet attached to the Advisory Action, the Examiner stated that "Fulghum further discloses using 1/2 to 1/3 of pixels [see column 10 lines 1-15] which constitutes subset of all the pixels." As discussed below, this "1/2 to 1/3" is a level within a

[1] Since the Final Office Action did not point out where the limitation of control pixels being a *subset* of the plurality of pixels was taught in the prior art (in Fulghum or in any other reference), a *prima face* rejection has not been presented in the Final Office Action.

pixel in a derived image, not a number or amount of pixels, and thus cannot equate to "the control pixels being a subset of the plurality of pixels".

In the March 29, 2011 Notice, the Examiner highlighted the phrase "selected pixel" in Fulghum, col. 10, line 21. As discussed below, this alternate use of the concept of subset is, in Fulghum, referring to a pixel within an output or image (and thus cannot equate to the control pixels being a subset of a plurality of pixels in an imager), and in addition, does not fit with the use of subset in the Advisory Action.

Some sections of Fulghum to which the Examiner cited describe analyzing each pixel of an image which is derived from other images (column 9, col. 56, "ratio image") output to a user for an abnormality (dysplasia, see col. 9, line 34) analysis. This is in contrast to Applicants' claims which describe using a subset of pixels of an imager, an input device. These sections of Fulghum do not teach using the pixels of an imager (a physical device) as input for any reason (including illumination level control) but rather teach setting the output of image pixels in an image which itself is derived, and not taken directly from an imager. (Fulghum, col. 9, line 56; col. 10, l. 6, line 12). The "ratio image pixel value" which may be, e.g., 1/3 (e.g., Fulgham, col. 9, line 67), is simply not equitable with a number of pixels (subset of pixels).

In addition, Applicants' claims require the control pixels to be a subset of the plurality of imager pixels – the claims are defining a certain number of pixels which are part of a larger number of pixels. The "1/2 to 1/3" to which the Examiner refers in some parts of Fulghum does not describe an amount or number of pixels. These sections of Fulghum instead describe a level (e.g., 1/2) within each pixel analyzed. If this ratio is met, the pixel value in the output image is set to green only, to indicate to a viewer that a dysplasia exists (Fulghum, col. 10, ll. 5-14). The section of Fulghum to which the Examiner cited in the Advisory Action does not teach using a ratio of half or a third to define a number of pixels, but rather teaches using half or a third as a ratio of a level for processing individual pixels. (Fulghum col. 9, l. 66 to col. 10, l. 5). In addition, even if the Examiner is correct in equating Fulghum's one-half to one-third with "the control pixels being a subset of the plurality of pixels", the one-half to one-third is not used to control an imaging parameter to optimize

imaging conditions for capturing images, but rather to change the color of pixels in an already captured image to a 'marker' color.

The portion of Fulghum cited to by the Examiner in the March 29, 2011 Notice ("selected pixel" at col. 10, line 21) describes "selected pixels" which are *output* pixels to be reset, displayed in an image to a user (see Fulghum, col. 9, line 65), not *input* pixels in an imager, as in Applicants' claims. This use of selected pixels as being equivalent to a subset is in contrast to the Examiner's use of a ratio (half or a third) of a pixel level.

It does not make grammatical or logical sense to "record, via one or more control pixels, the control pixels being a subset of the plurality of pixels, the amount of the white light that is reflected to the imaging device" (claim 81) while defining, as the Examiner does, "subset" as either a level within a pixel or a number of output pixels in an image, as in Fulghum.

Fulghum does not describe using a certain number of pixels to record a level of white light. Fulghum does not teach control pixels, or "control pixels being a subset of the plurality of pixels".

Other References

The Examiner stated in the Final Office Action that Yamanaka discloses controlling light operation based on a plurality of pixels, and that Higuchi teaches a plurality of pixels and controlling light operation. However, the Examiner did not assert that either Yamanaka or Higuchi disclosed "control pixels being a subset of the plurality of pixels." It is unclear which teachings of each of these references is applicable to Applicants' claims, and thus a *prima face* rejection was not presented.

On page 3 of the Final Office Action the Examiner stated that Applicants' Application discloses that control pixels may be adapted for fast readout which is well known in the art. However, in the section of the Application to which the Examiner cited, page 28 lines 12-16 (paragraph [0129] of the Application as published, as cited by the Examiner), "fast readout" is the only teaching that is described as being known in the art. Page 28 lines 12-16 (paragraph [0129]) states that the novel use of control pixels is new and is not in the prior art. Page 33, lines 12-18 (paragraph [0151] of the Application as published, also cited to by the

Examiner), merely states that in one embodiment the control pixels may be regular pixels assigned to the function of control pixels.

In addition, neither of Yamanaka or Higuchi included control pixels as claimed in Applicants' pending claims.

On page 4 of the Final Office Action the Examiner asserted that Tanaka taught an "exposure control time value" and determining an amount of light based on "exposure time." However, these teachings do not disclose comparing light received at "a sampling instance" as required in claim 90.

In addition, Tanaka does not teach or disclose Applicants' claim limitations. Column 8, ll. 26-43 and column 5, ll. 44-59 of Tanaka does not disclose capturing images "across a plurality of imaging periods", as asserted by the Examiner on page 2 of the Final Office Action. The Examiner notes on page 3 of the Final Office Action that Tanaka does not disclose operating the light source via control pixels.

Conclusion

Therefore, independent claims 81, 90, 97 and 100 are allowable over Tanaka, Yamanaka, Higuchi, Fulghum, and the information provided in Applicants' specification, alone or in combination.

Each of claims 85, 91, 98-99, and 101-102 depends from one of claims 81, 90, 97, or 100 and includes all the limitations thereof. Therefore, each of claims 85, 91, 98-99, and 101-102 are likewise allowable.

Accordingly, Applicants respectfully request that the rejection of claims 81, 85, 90-91, and 97-102 under 35 U.S.C. § 103 be withdrawn.

Please charge the $540.00 fees for the Appeal Brief to deposit account No. 50-3355. No additional fees are believed to be due in connection with this paper. However, if any such fees are due, please charge any fees associated with this paper to deposit account No. 50-3355.

Respectfully submitted,

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CLAIMS APPENDIX

1-80 (Cancelled)

81. An in vivo imaging device comprising:

a light source;

an imager comprising a plurality of pixels; and

a controller, wherein the controller is configured to, across a plurality of imaging periods, within each imaging period, operate the light source to emit white light, record, via one or more control pixels, the control pixels being a subset of the plurality of pixels, the amount of the white light that is reflected to the imaging device, control the image gain level of the imager based on the amount of the white light that is reflected to the control pixels, and capture and transmit an image frame.

82-84. (Cancelled)

85. The imaging device of claim 81, wherein said controller is to control at least one parameter selected from the group consisting of image gain level, illumination duration and illumination intensity.

86. (Withdrawn) An in vivo imaging device comprising:

a light source;

an imager; and

a controller, wherein the controller is configured to detect problematic pixels in said imager, and define said problematic pixels as non-functional.

87. (Withdrawn) The device of claim 86, wherein said imager is configured to provide an exposure that is of a shorter duration than typically required for saturation of a functional pixel.

88. (Withdrawn) The device of claim 86, wherein said controller is to detect at least one pixel that reflects a saturation level above a threshold saturation level.

89. (Withdrawn) The device of claim 86, wherein the device is a swallowable capsule.

90. A method for operating an in vivo imaging device including at least one light source and an imager comprising a plurality of pixels, the method comprising:

across a plurality of imaging periods:

operating at least one light source to emit white light within an imaging period;

at a sampling instance, recording the amount of the white light that is reflected to one or more control pixels, the control pixels being a subset of the plurality of pixels;

comparing an amount of the white light recorded at at least one sampling instance within said imaging period to a determined light saturation threshold; and

controlling the imaging device's gain factor in relation to the difference between said recorded amount of the white light and said light saturation threshold; and

capturing and transmitting an image frame.

91. The method of claim 90, comprising controlling the operation of the light source in relation to the difference between said amount of light recorded and said light saturation threshold.

92. (Withdrawn) An in vivo imaging device comprising:

a light source;

an imager; and

a controller, wherein the controller is adapted to operate the light source to provide dark frames at determined frame intervals and record the amount of light reflected to the imager during said dark frame.

93. (Withdrawn) The imaging device of claim 92, wherein said dark frame includes a frame wherein a substantially inadequate amount of light is exposed by said light source.

94. (Withdrawn) The imaging device of claim 92, wherein said controller is capable of determining the location of the device according to said amount of light reflected to the imager during said dark frame.

95. (Cancelled)

96. (Cancelled)

97. A method for changing the operation mode of an in vivo device comprising an imager, the imager comprising a plurality of pixels, and a light source, the method comprising:

across a plurality of imaging periods, in each imaging period, operating the light source to emit white light, recording the amount of the white light that is reflected to

one or more control pixels, the control pixels being a subset of the plurality of pixels, in response to the recorded amount, adjusting an image gain level of the imager, and capturing and transmitting an image frame;

measuring at least one environment parameter in at least one environment surrounding the device; and

when an environmental change is determined, changing the operating mode of the device.

98. The method of claim 97, wherein said environmental change is at least one change selected from the group consisting of temperature change, pH level change and light level change.

99. The method of claim 97, wherein a controller determines when a significant environmental change is determined.

100. A method for changing the operation mode of an in vivo device comprising an imager, the imager comprising a plurality of pixels the method comprising:

across a plurality of imaging periods, within each imaging period:

operating a light source to emit white light, recording the amount of white light that is reflected to one or more control pixels, the control pixels being a subset of the plurality of pixels, in response to the recorded amount, adjusting a gain level of an imager within the device, and capturing and transmitting an image frame;

measuring at least one environment parameter in at least one environment surrounding the device, using at least one environment measuring tool; and

when an environmental change is determined, changing the operating mode of the device.

101. The device of claim 81, wherein the controller is to record the amount of the white light that is reflected to the imaging device and control the image gain level, repeatedly during a plurality of time periods during the imaging period.

102. The method of claim 90, wherein the controller is to record the amount of the white light that is reflected to light measuring element and control the gain factor, repeatedly during a plurality of time periods during the imaging period.

EVIDENCE APPENDIX

None

RELATED PROCEEDINGS APPENDIX

None